

Recent health claim approvals make it imperative to know your...

Whole-grain OPTIONS

BY CLYDE E. STAUFFER, Ph.D.

"Development of heart disease depends on many factors. Eating a diet low in saturated fat and cholesterol and high in fruits, vegetables and grain products that contain fiber may lower blood cholesterol levels and reduce your risk of heart disease."

(21CFR§107.77)

"Development of cancer depends on many factors. Eating a diet low in fat and high in grain products, fruits and vegetables that contain dietary fiber may reduce your risk of some cancers."

(21CFR§107.76)

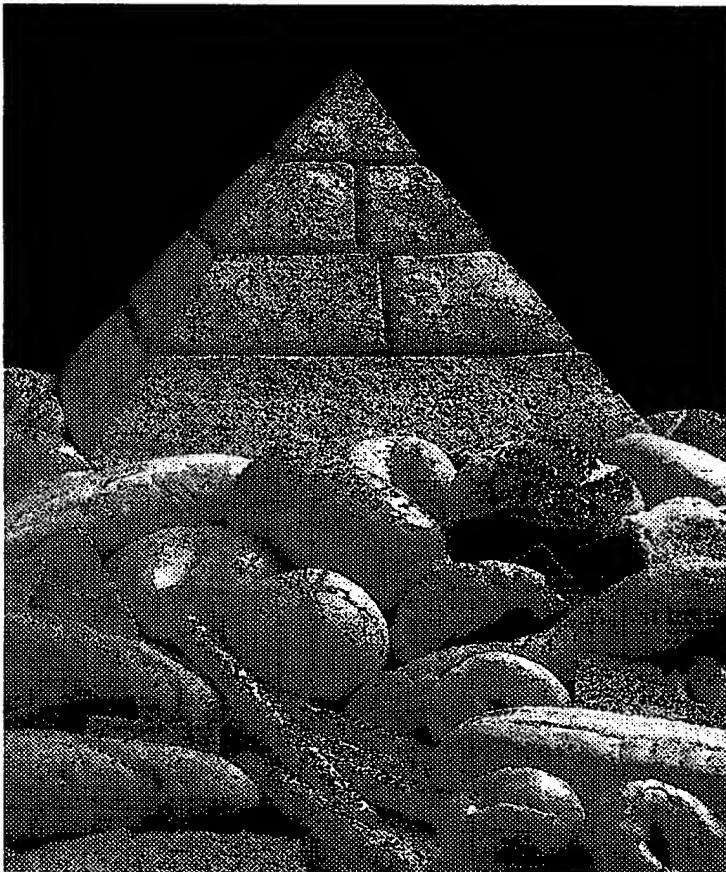


The health claim vignettes at left, approved by the Food and Drug Administration as examples of wording manufacturers may use on product packages, support increasing consumer interest in whole grain products — "grain products that contain dietary fiber."

Grains most often found in baked foods include wheat, oats, rye, barley, corn, and flaxseed. (Other cereals and seeds occasionally used are rice, sorghum, amaranth, soy grits or flour, sesame seed, sunflower meats, and poppy seed.) Table 1 on page 68 gives typical total dietary fiber (TDF) contents for these six whole grains.

Wheat. Bakers are well acquainted with whole-wheat flour. It is simply the whole seed ground to the fineness of flour, containing all the bran and germ. Because the germ is rich in oil and enzymes, rancidity is possible, depending on storage conditions. Whole-wheat flour should be stored in a cool, dry place.

Bulgur is wheat that has been soaked, steamed, then



dried. This process gelatinizes much of the starch so bulgur cooks up and is ready to eat more quickly than regular wheat. In commercial adaptations, grain is soaked, steamed, then cracked by passing through rollers. Most bread includes the resulting nuggets for their appealing texture and flavor, but without the hard bite sometimes experienced when using cracked wheat.

Oats. Steaming and flaking groats (dehulled oats) on a roller mill produces rolled oats. If groats are first broken into smaller pieces the resulting product is baby oat flakes, or baby oats.

Oat flour, made by grinding groats to flour fineness, contains the raw endosperm. Its relatively high fat content (ca. 6.3%) and en-

"Soluble fiber from foods such as [name of food product], as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease."
(21CFR§101.81)

zyme lipase, make oat flour subject to rancidity. Steaming inactivates the enzyme, stabilizing the groats against rancidity.

In whole oats, about 40% of the TDF is soluble fiber, a factor to consider when using whole oats to meet the "soluble fiber" health claim (see Oat Bran, page 68).

Rye. Rye grows well in cooler climates with a short growing season, hence it is a major cereal crop in regions such as northern Europe. Methods and recipes for producing bread from rye flour alone have been developed in these areas. In the United States, rye bread usually contains a mixture of rye and wheat flours.

The extraction rate in milling produces flours with different depths of color and TDF content — white rye at 60% extraction has 4.5% TDF, while dark rye at 100% extraction has 11.5% TDF. Pumpernickel rye is a coarsely ground whole rye flour. Rye flakes add texture to baked food.

Barley. While barley is more often connected with malting and brewing than with baking, it was traditionally used to make "poor folk's bread." Ordinary barley has a tight hull, removed by abrasion to make pearl barley. This is either flaked or ground to flour for use in food products. Recent agronomic research has yielded no-hull and high-fiber barley varieties, which are in various stages of commercial development.

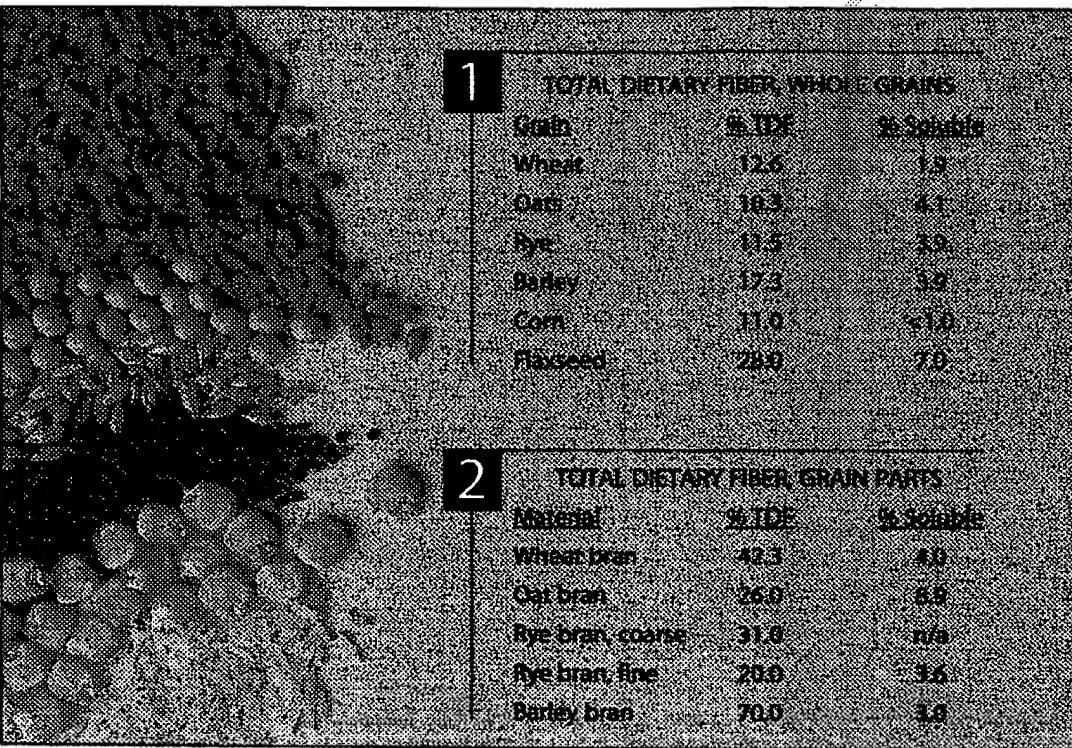
"Granary" bread uses malted barley. Malting converts some of the starch to sugars, imparting a sweet taste. For baking, malted barley is dehulled and broken into smaller pieces.

Corn. After removing the hull and germ, corn (maize) is broken and ground to various extents. Grits (roughly eight pieces per kernel) are flaked (corn flakes) or cooked as such. Meal is used for corn bread, and finds its way into numerous other products such as muffins and waffles. A variety of baked foods use corn flour, which adds a mild corn taste and some tenderness.

Flaxseed. Flax (linseed) is usually processed for its oil (about 40% oil content). Defatted flaxseed is sometimes included in multi-grain bread mixes. Whole and defatted seeds impart a nutty flavor to variety bread and rolls. The oil has a high linolenic acid content, and recently flaxseed has been touted as a good source of this omega-3 acid, with purported nutritional advantages.

DERIVED GRAIN PRODUCTS. Besides the whole grains listed above, grain parts (generally the bran) may also be used to provide dietary fiber in a baked food. Some sources are listed in Table 2 on page 68.

Wheat bran. Purified wheat bran may be added to dough to increase a product's dietary fiber content. Since the germ portion is removed, wheat bran



1 TOTAL DIETARY FIBER: WHOLE GRAINS

Material	% TDF	% Soluble
Whole wheat	12.6	1.5
Oats	10.3	4.1
Rye	11.3	3.8
Barley	17.3	5.9
Corn	11.0	4.0
Flour-ceil	28.0	7.0

2 TOTAL DIETARY FIBER: GRAIN PARTS

Material	% TDF	% Soluble
Whole grain	42.3	4.0
Oat bran	26.0	5.9
Rye bran, coarse	31.0	n/a
Rye bran, fine	25.0	3.5
Barley bran	70.0	1.0

does not readily develop rancidity, so cool storage is not absolutely necessary.

Oat bran. F.D.A.'s recently approved health claim renewed interest in oat bran as an ingredient:

According to the regulation, if the soluble fiber is from oats, the serving must contain at least 0.75 g of beta-glucan. (Psyllium husk, the other specified source, must contribute at least 1.7 g of soluble fiber per serving.) This regulation also specifies that oat bran must be derived from grinding and fractionating groats. The bran must represent no more than 50% of the groat weight, and contain at least 5.5% soluble fiber and 16% TDF. Commercial oat bran actually has a higher TDF content, of which about one-third is soluble fiber.

Rye bran. The difference in TDF content of coarse versus fine rye bran is a consequence of the milling sequence. Coarse bran is made from the earlier milling streams, hence it is a purer bran coat. Fine bran contains a higher proportion of the endosperm. Rye bran generally finds its most value in a "multi-bran" product, by adding to the number of grain products listed on the ingredient list.

Barley bran. Obtained during the pearling process (removal of hull and bran coat by abrasion milling), barley bran has the highest TDF content of the grain

products listed. Mass commercialization of this ingredient for baking still depends on interest by bakers.

FORMULATION AND PROCESSING. Addition of whole grain or grain products to a yeast-raised formula puts stress on the gluten matrix. If a flour's gluten strength is already marginal, this added weight decreases loaf volume and increases proof time.

Remedies usually call for adding vital wheat gluten (to increase the integrity of the gluten matrix) and increasing formula yeast (to bring proof times back into the desired range). The adjustment amount relates to the amount of weight added.

For example, a multi-grain bread containing 15% variety grains may need an additional 4% vital wheat gluten and 5% to 6% yeast. This keeps proof times in line with other products on the line and makes a loaf with desirable volume and texture.

Chemically leavened products such as muffins do not depend on gluten for their structure. Therefore, the added weight of whole grain products does not affect volume and texture as it does for yeast-leavened products.

However, developing desirable volume and texture during baking depends on the correct viscosity of the



batter. Dietary fiber absorbs one to 10 times its weight of water. Simply adding a dietary fiber source (such as bran) to a batter formula will increase batter viscosity. Extra water is necessary to achieve proper viscosity.

On the other hand, many fibers take a while to be fully

wetted, so batter viscosity can increase with time. It is necessary to take into account any time lags between mixing and baking. It is preferable to give the batter time to stabilize before depositing and baking.

In making doughs for low moisture products such as cookies and crackers, extra water may be necessary in order to achieve good machinability. This extra water must then be baked out, so high fiber crackers generally need a much longer bake time than a regular cracker.

As a rule, soluble fibers absorb more water than insoluble fibers. The addition of oat bran, for example, to a cracker will require more water than wheat bran to obtain the same dough machining properties.

PRODUCT COMPOSITION RESTRICTIONS. When designing a product to meet one of the three health claims, it

"Soluble fiber is effective in reducing hyperlipidemias, while insoluble fiber (the two fiber types providing the total dietary fiber amount in a food) is valuable for alimentary dysfunction."

—L. Prosky, Division of Nutrition, F.D.A.

must meet certain finished product composition tests.

If the health claim in mind is reducing the risk of cancer (21CFR§101.76) the food must qualify as a low fat food (less than 3 g per reference serving) and must be a "good source" of TDF (2.5 g - 4.75 g per serving).

If pursuing the health claim for reducing the risk of coronary heart disease (21CFR§101.77), a serving must be low in saturated fat (less than 1 g), low in cholesterol (less than 20 mg), low in total fat (less than 3 g), and contain at least 0.6 g of soluble fiber.

The regulation authorizing a health claim linking soluble fiber and reduced risk of coronary heart disease (21CFR§101.81) specifies the use of an oat product giving at least 0.75 g of soluble fiber per serving, or psyllium husk providing at least 1.7 g of soluble fiber per serving. In addition, the food must be low in saturated fat, low in cholesterol, and low in total fat.

Any way you use grain or parts of grains, knowing your options will allow healthier products, more innovative development and better chances of success in production and the marketplace.

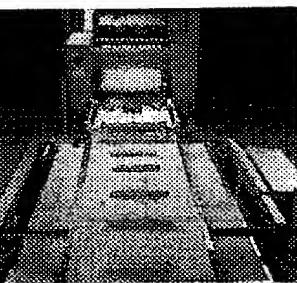
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1000 Central Pkwy North
Suite 120
San Antonio, TX 78229
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